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(71) Applicant: **WARNER-LAMBERT COMPANY**
201 Tabor Road
Morris Plains New Jersey 07950(US)

(72) Inventor: **Zamudio-Tena, Jose F.**
95-1/2 Mills St.
Morristown, New Jersey 07960(US)
Inventor: **Silva, Jose N.**
3445 58th St.
Woodside, Queens, New York 11377(US)
Inventor: **Glass, Michael**
10-15 Ellis Avenue
Fair Lawn, New Jersey 07410(US)

(74) Representative: **Jones, Michael Raymond et al**
HASELTINE LAKE & CO. Hazlitt House 28
Southampton Buildings Chancery Lane
London WC2A 1AT(GB)

(54) **Production of sorbitol coated comestible.**

(57) A process for producing a sorbitol coated comestible capable of being dyed without the colour fading or becoming mottled is disclosed, in which first and second sorbitol coating solutions are applied to a substantially anhydrous edible core to coat the edible core. The first sorbitol solution contains:

- (a) from 25 to 85 wt % of a sorbitol solution of to 75 wt % sorbitol,
- (b) from 3 to 20 wt % crystalline sorbitol powder,
- (c) from 0.10 to 10 wt % of at least one film forming agent,
- (d) from 0.10 to 15 wt % of at least one crystallization retardant including powdered gum arabic, and
- (e) water.

The second coating solution contains:

- (a) from 50 to 90 wt % sorbitol solution of from 65 to 75 wt % sorbitol,
- (b) from 5 to 20 wt % crystalline sorbitol powder,
- (c) about 0.5 to about 10 wt % of at least one crystallization retardant, including powdered gum arabic, and
- (d) water.

After application of each coating solution, the solution is dried to prepare a final product which is a smooth, hard and crunchy comestible, with an even colour distribution.

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PRODUCTION OF SORBITOL COATED COMESTIBLE

The present invention relates to an improved process for producing a sorbitol coated comestible, and more particularly to a process for producing a sorbitol coated comestible having a smoother and glossier appearance than those of prior art and capable of being dyed without the color fading or becoming blotchy or mottled over time, and also to sorbitol coated comestibles produced therefrom.

5 In the past, chewing gums in the form of shaped centers or cores, e.g., pellet gums, have been coated both with sugar and sugarless coatings to produce a candy-like, crunchy outer taste in the mouth with a chewable gum center portion. Conventionally, the core is a soft chewing gum portion, whereas the coating is crunchy or hard. In the case of sugarless coatings, aqueous solutions of xylitol, mannitol, maltitol and sorbitol, known as syrups, have been primarily employed. Such syrups may contain additives such as
10 moisture absorbing compounds, anti-adherent compounds, dispersing agents, film-forming agents, binders and the like.

U.S. Patent No. 4,127,677 discloses a xylitol-coated chewing gum. The coating is applied via a coating syrup containing from about 55% to 75% solids of which from about 95% to about 99.5% is xylitol. The solids also include about 0.5% to about 1.5% of colorant (e.g., titanium dioxide), and about 0.5% to about
15 1.5% binder and/or suspending agent, (e.g., gum arabic).

U.S. Patent No. 4,238,510 discloses a sugarless coated comestible whose coating comprises sweet material in crystalline form. The coating consists essentially of sorbitol alone or in admixture with mannitol and/or hydrogenated starch hydrolysate. The sorbitol is disclosed as being present in an amount within the range of from about 45% to about 90% by weight of the coating. It also discloses a method for applying the
20 sugarless coating to centers. The method includes the steps of applying to the centers a first coating syrup which contains a sweetener such as sorbitol and/or other non-sugar sweetener, for example, mannitol or hydrogenated starch hydrolysate, an adhesion or binder component and a film-forming component, to thereby coat the centers with the first coating syrup, and a dusting mix applied to the centers coated with the first coating syrup. The dusting mix includes one or more sweeteners, such as employed in the first
25 coating syrup, in powder form, and a moisture absorbing component, an anti-sticking component and a dispersing agent. It is disclosed that if desired, a second coating syrup may be applied to smooth out the coating of the centers and provide a shine thereto. The second coating generally includes ingredients similar to that present in the dusting mix but dispersed in water.

U.S. Patent No. 4,317,838 discloses a method for forming a sugarless coating on centers of chewing
30 gum or other comestibles which includes the steps of applying to the centers a coating syrup which contains a sweetener such as sorbitol and/or other non-sugar sweetener, an adhesion or binder component such as gum arabic, a film-forming component, an anti-adherent or filler component, and a dispersing agent. A dusting mix including one or more sweeteners, such as employed in the coating syrup, in powder form, and a moisture absorbing component, an anti-adhering component and a dispersion agent are also
35 employed.

U.S. Patent No. 4,753,790 discloses a method for forming a sorbitol coating on centers of chewing gum or other comestibles without employing a dusting mix which includes the steps of applying to the centers at least two coating syrups, beginning with a first coating syrup that contains a saturated sorbitol solution, crystalline sorbitol, a film-forming component and at least one crystallization retardant including calcium
40 carbonate and/or titanium dioxide, in an aqueous solution. This is followed by a second coating syrup to smooth out the coating of the centers, similar in composition to the first syrup except that it employs more saturated sorbitol solution, less crystalline sorbitol, slightly more film-forming component and less crystallization retardant in an aqueous solution. This may be followed by an optional third binder coating solution and a fourth coating solution. Neither the first nor the second coating syrup is used in combination
45 with a dusting mix.

The problems associated with forming a sorbitol coating on comestibles, e.g. chewing gum, have been many. These problems include, as disclosed by U.S. Patent No. 4,177,667, chipping, flaking and cracking of the coating upon the attainment of the desired coating thickness, mottling of the coating, poor texture (such as a rough surface) and lack of crunchiness upon the initial chewing of the comestible. In addition, sorbitol
50 coatings are often difficult to mix into solution and as a result the final coating may exhibit a gritty or sandy texture. Without wishing to be bound by theory, it is believed that some of these problems may be due to inflexibility of the coating in response to the geometric shape of the comestible being coated, inefficiency of the film-forming properties of the coating, and a lack of uniformity in the crystallization of the sweetener throughout the coating. These coatings also suffer from the inability to evenly disperse a water-soluble dye. Sugarless coatings have traditionally been white for this reason, due to the presence of titanium dioxide,

employed as a dispersing agent, and calcium carbonate, employed as a dispersing agent and bulking agent, both of which also function as white pigments and colorants. Dyes, when used, tend to be diluted and hidden by these compounds. Titanium dioxide also acts as a photolytic agent causing decomposition of the dyes, causing the color to fade and resulting in a blotchy, mottled appearance. As the color fades, the titanium dioxide visibly appears and further masks any remaining color. For this reason, until now, the use of colored dyes in sugarless coatings has been avoided.

U.S. Patent No. 4,753,790 addressed the problems of coating, chipping, flaking and lack of crunchiness through the use of crystalline sorbitol and crystallization retardants together with a film-forming component. However, because the crystallization retardants include titanium dioxide, blotchy, mottled color appearance still results when FD&C dyes are used with the coating disclosed by this patent.

Therefore, a process for producing a sorbitol coated comestible without titanium dioxide whose coating can be dyed without the color fading or becoming blotchy or mottled, in addition to having good appearance, good texture, good flexibility relative to the shape of the comestible being coated, good film-forming properties, and good crunchiness, would be a welcome contribution to the art. Such a contribution is provided by this invention.

SUMMARY OF THE INVENTION

This invention provides a process for producing a sorbitol coated comestible whose coating can be dyed without the color fading or becoming blotchy or mottled and which has good appearance, good texture, good flexibility, good film-forming properties and good crunchiness. That is, the coated comestible so prepared has a smooth, hard and crunchy coating, which is capable of being dyed without the color fading or becoming blotchy or mottled. The sorbitol coating is obtained by applying to the comestible two coating solutions, each solution comprising a saturated sorbitol solution, a crystalline sorbitol powder, one or more film-forming agents, which are optional for the second solution, and one or more crystallization retardants, including powdered gum arabic, and then drying the coated comestible after each coating is applied. The amounts of saturated sorbitol solution, crystalline sorbitol powder and the specific crystallization retardants is such that amounts outside the required ranges, either above or below, results in coatings deficient in one or more of the desired properties set forth heretofore. The coating solution can additionally contain binders, plasticizers and moisture absorbants, as well as other known in the art additives, such as, for example, dyes and artificial sweeteners. Also provided are the sorbitol coated comestibles produced by the process of this invention.

Thus, this invention provides a process for producing a sorbitol coated comestible which comprises applying to a substantially anhydrous edible core first and second coating solutions comprising sorbitol to coat the edible core,

wherein the first solution comprises,

(a) about 50 to about 85 wt %, preferably about 60 to about 75 wt %, sorbitol solution comprising about 65 to about 75 wt %, preferably about 70 wt % sorbitol,

(b) about 3 to about 20 wt %, preferably about 5 to about 15 wt %, most preferably about 8 to about 13 wt % crystalline sorbitol powder,

(c) about 0.10 to about 10 wt %, preferably about 0.2 to about 7 wt %, most preferably about 0.3 to about 5 wt % of at least one film-forming agent dispersed therein; and

(d) about 0.10 to about 15 wt %, preferably about 0.02 to about 10 wt % of at least one crystallization retardant, including powdered gum arabic; and

wherein the second coating solution comprises,

(a) about 50 to about 90 wt %, preferably about 70 to about 80 wt % sorbitol solution comprising about 65 to about 75 wt %, preferably about 70 wt % sorbitol;

(b) about 5 to about 20 wt %, preferably about 8 to about 14 wt %, crystalline sorbitol powder,

(c) about 0.5 to about 10 wt %, preferably about 1 to about 5 wt %, of at least one crystallization retardant, including powdered gum arabic; and after application of each coating solution, the solution is dried to prepare a final product which is a smooth, hard, and crunchy comestible.

DETAILED DESCRIPTION OF THE INVENTION

The cores that are coated may be any substantially anhydrous, edible, or ingestible core capable of having a sorbitol coating applied to it. Such cores include chewing gums, candies, nuts such as almonds,

chunks of licorice, jellies, bonbons cast in starch molds, popcorn (preferably that obtained from corn dough because of a more regular form), tablets obtained by compression of various baked or agglomerated masses, pills or tablets for medicinal or therapeutic purposes, and the like. Preferably, chewing gum is utilized as the core whereby a sugarless coated chewing gum is prepared in a CHICLETS® (trademark of Warner-Lambert Company), pelletized, type of format.

By substantially anhydrous it is meant that the moisture content present in the edible core is not readily available or not readily capable of migrating through or from the core into any applied sorbitol coating. Thus, for example, candy cores comprising nougat or nougat-like material having a moisture content up to about 10 wt % may be utilized since the moisture available does not readily migrate into any applied sorbitol coating. When the core comprises a chewing gum, the chewing gum composition can have a moisture content up to about 5 wt % with up to about 3 wt % of water being preferred and up to about 2 wt % being most preferred and from about 0.5 to about 1.5 wt % being even more preferred.

The sorbitol solution used is a saturated solution of sorbitol. Those skilled in the art will appreciate that the concentration of the sorbitol in the saturated solution may vary in accordance with the temperature of the solution, but generally such saturated solution contains about 65 to about 75 wt % sorbitol with about 70 wt % being preferred. Sufficient saturated sorbitol solution is utilized in the coating solution such that when in combination with the crystalline sorbitol powder, and upon application of the coating solution to a coatable substrate, relatively uniform crystallization of the sorbitol occurs throughout the coating.

Similarly, sufficient crystalline sorbitol powder is utilized, relative to the amount of saturated sorbitol solution used, such that when the coating solution is applied to a coatable substrate, relatively uniform crystallization of the sorbitol throughout the coating occurs. Without wishing to be bound by any one theory, it is believed that the sorbitol crystalline powder acts as a seed crystal for the saturated sorbitol solution. Therefore, sufficient crystalline sorbitol powder is needed to result in the crystallization of the sorbitol contained in the coating solution. An insufficient amount of such crystalline powder can result in poor crystallization and coatings that do not properly adhere to the substrate. For example, in the application of multiple coatings, the coating being applied may dissolve the previous coating which was applied. This results in coatings having a poor or aesthetically undesirable appearance. Too much crystalline sorbitol powder can result in solutions which are too viscous. Such solutions would not distribute evenly and would not coat evenly on the cores to which they are applied. This would result in a sticky coating, a rough coating, and/or a pitted coating.

At least one film-forming agent is utilized in the preparation of the coating solution. It has been discovered that the film-forming agents have a critical particle size whereby maximum dissolution may be achieved. Whereas, most of the film-forming agents will generally remain dispersed in the coating solution, within the critical range more of the agent will be dissolved. This allows for a more homogenous, creamy coating solution. The film-forming agents are first passed through a colloidal mill to achieve a particle size of about 5 to about 15 microns. The milling generally is performed when the agents are in aqueous medium, and then added to the sorbitol coating solution, but it is also possible to perform the colloidal milling directly on a sorbitol coating solution having the agent dispersed therein. The specific gravity of the solution at 55°C is 1.35 and the viscosity at 55°C is 80 cps \pm 20 cps measured with a Brookfield Viscometer Model LVT spindle #3 at 30 RPM for one minute.

The table below shows the percent of film-forming agent in solution as a function of particle size.

Size Microns (mean)	% in Solution
25	1.0
20	2.0
15	25.0
10	45.0
5	20.0
3	5.0
1	2.0

These agents are dispersed in the coating solution. Representative film-forming agents include hydroxypropyl cellulose, methyl cellulose, (i.e., methyl ether of cellulose) ethyl cellulose, hydroxypropyl methyl cellulose, hydroxyethyl cellulose, carboxymethyl cellulose, gelatin, mixtures thereof, and the like. Preferably, a branched chained film-forming agent such as hydroxypropyl cellulose is utilized. Preferably, the hydrox-

ypropyl cellulose has a Brookfield viscosity of not less than about 145 cps for a 10% aqueous solution at 25° C; and the methyl cellulose can have a Brookfield viscosity of about 12 to 18 cps for a 2% aqueous solution at 25° C. The coating solution can contain more than one film-forming agent and as such, for example, hydroxypropyl cellulose and methyl cellulose may be utilized. In such a combination the branched
 5 chained film-forming agent (e.g., hydroxypropyl cellulose) can be used in amounts of about 0.10 to about 5.0 wt %, with about 0.2 to about 1.0 wt % being preferred, and the straight chained film-forming agent (e.g., methyl cellulose) can be used in amounts of about 0.10 to about 5.0 wt %, with about 0.2 to about 1.0 wt % being preferred. The use of film-forming agents is optional in the second coating solution.

Again without wishing to be bound by any one theory the crystallization retardant is believed to prevent
 10 premature crystallization of the sorbitol and therefore prevent, for example, clumping or uneven coatings. The present invention replaces all of the titanium dioxide and some of the calcium carbonate crystallization retardant of U.S. Patent No. 4,753,790, with powdered gum arabic. It is believed that the removal of the titanium dioxide and the reduction in quantity of calcium carbonate decreases the crystallization retardant color hiding experienced with the compositions of this patent, as well as eliminating the photolytic
 15 decomposition caused by the titanium dioxide. It is also believed that the powdered gum arabic similarly serves to prevent premature crystallization of the sorbitol to prevent clumping and uneven coatings.

While mixtures of calcium carbonate and powdered gum arabic are preferred crystallization retardants, talc and/or magnesium trisilicate may also be included in this mixture. However, more preferably, a combination of calcium carbonate and powdered gum arabic is utilized. Calcium carbonate is utilized in
 20 amounts of about 0.5 to about 8 wt% preferably about 1.0 to about 5.0 wt %, and more preferably about 1.5 to about 3.0 wt %. The powdered gum arabic is utilized in amounts of about 0.05 to about 10 wt %, preferably about 0.1 to about 8.0 wt %, and more preferably about 1.0 to about 5.0 wt %. Other components such as water-soluble FD&C dyes, plasticizers, artificial sweeteners, and moisture absorbants may be added to the coating solution.

Plasticizers suitable for use are water soluble. Examples include polyethylene glycol; polyvinylpyrrolidone; oligomers of polypropylene glycol (e.g., such as those having an average molecular weight of about 1000 to about 2000); polyvinyl alcohol; low molecular weight polyvinyl acetate (e.g., such as average molecular weights of about 800 to about 1200); water-soluble natural gums, such as alginates, xanthan gum, carrageenan, agar, and mixtures thereof, and the like. The plasticizer is optionally used in the first coating
 30 solution in amount of about 0.1 to about 1.0 wt %, with about 0.3 to about 0.4 wt % being preferred. The second coating solution can optionally contain the plasticizer in amounts from 0. to about 1.0 wt %, with about 0.4 to about 0.8 wt % being preferred. The preferred plasticizer is polyethylene glycol.

Moisture absorbants, when used, can be mannitol, dicalcium phosphate, talc, magnesium stearate, calcium phosphate, calcium sulfate, silicas, and the like. Examples of silicas which may be useful include
 35 amorphous silicas, synthetic amorphous silicas, hydrous silica gels, synthetic silicas, sodium aluminum silicates, precipitated amorphous silicon dioxide of ultra fine particle size, and the like. Usually, the moisture absorbent is used in amounts of about 0.1 to about 5.0 wt %, with about 0.5 to about 3.0 % being preferred, in the first coating solution. Preferably, mannitol is used as the moisture absorbent.

Artificial sweeteners such as the soluble saccharin salts, i.e., sodium or calcium saccharin salts, cyclamate salts, acesulfam-K, chlorinated sucrose derivatives, alitame, dihydrochalcones, and the like, and
 40 the free acid form of saccharin may optionally be added to the coating solutions. Dipeptide sweeteners such as L-aspartyl-L-phenylalanine methyl ester and materials described in U.S. Patent No. 3,492,131 and the like may also be used. These are for illustrative purposes only and other artificial sweeteners are contemplated. These sweeteners may be used in amounts of about 0.05 to about 1.0 wt % based on the weight of the total coated comestible, and preferably about 0.1 to about 0.5 wt %. Usually, the first
 45 coating solution can contain about 0.05 to about 1.0 wt % based on the weight of the coating, preferably about 0.1 to about 0.8 wt % and most preferably 0.5 wt % of artificial sweetener. The second coating solution can usually contain about 0.05 to about 1.0 wt %, based on the weight of the coating, with about 0.3 wt % to about 0.5 wt % being preferred of artificial sweetener.

In carrying out the process of the invention, the application of a coating solution can be repeated as many times as necessary to build up a desired coating weight and thickness on the edible cores. For example, about 1 28% to about 32% shell coating may be obtained from about 30 to about 35 applications of the first coating solution. The second coating solution may then be applied until the desired amount of thickness is added to the first shell coating. For example, a total shell coating of from 30% to 40% may be
 50 provided by about 10 to about 20 coating solution applications of the second coating solution.

The coating solution may be applied utilizing known techniques, such as Pan Coating and spray coating techniques. For example, in a pan coating method the comestible, e.g., chewing gum core, is placed in a revolving coating pan and dedusted during cool dry air. The coating solution is added to the revolving pan

in portions until the desired amount or thickness of coating is deposited on the comestible. Before each subsequent portion of coating solution is applied, the prior coating is allowed to dry by gently flowing warm air (about 80° F to about 105° F at about 250 CFM to about 500 CFM) over the comestible. Generally, the coating dries in about 5 to about 10 minutes. At any desired point in the sequence of coating applications, flavoring agents and water-soluble FD&C dye coloring agents may be added if desired. Usually these agents are added as a separately applied coating to the shell being produced.

Flavoring Agents (flavorings) may be added to the coating. Suitable flavoring agents include those described hereinafter for use in the chewing gum compositions. When applied in the coating the flavoring agent is usually used in amounts of about 0.01 to about 0.2 wt %, with about 0.08 to about 0.17 wt % being preferred and about 0.1 to about 0.15 wt % being most preferred.

Coloring agents include dyes suitable for food, drug, and cosmetic application known as the FD&C dyes and lakes, and the like. The materials acceptable for the foregoing spectrum of use are preferably water soluble. Illustrative examples include the indigo dye, known as FD&C Blue No. 2, which is the disodium salt of 5, 5-indigotindisulfonic acid. Similarly, the dye known as FD&C Green No. 1, comprises a triphenylmethane dye and is the monosodium salt of 4, [4-N-ethyl-p-(sulfonium-benzylamino) diphenylmethene][1-(N-ethyl-p-sulfonium-benzyl)-2,5-cyclohexdienimine]. A full recitation of all FD&C and D&C colorants and their corresponding chemical structures may be found in the Kirk-Othmer Encyclopedia of Chemical Technology, 3rd Edition, in Volume 6 at pages 561-595, which text is accordingly incorporated herein by reference. When applied in the coating the coloring agent is usually used in amounts of about 0.01 to about 0.25 wt %, with about 0.05 to about 0.1 wt % being more preferred, and about 0.08 wt % being most preferred.

After the final application of coating solution, and after such applied coating is dried, a sealing coating is preferably applied to the coated comestible. The sealing coating seals out moisture and aids in giving the coated comestible a polished appearance. The sealing coating comprises a sealant such as, for example, a blend of natural and artificial food grade waxes (such as a blend of beeswax, microcrystalline wax, paraffin wax, and the like), candelilla wax, shellac, and the like. Usually, the sealing coating comprises about 0.1 to about 2 wt % of the total coating, with about 0.5 to about 1.5 wt % being preferred.

When the edible core is chewing gum, the chewing gum composition may be formulated from standard ingredients and by known methods in the art. The composition comprises a gum base and such additional additives as would ordinarily be included to comprise a sugarless chewing gum composition, i.e., sweeteners comprising natural or synthetic sugar substitutes, flavor, fillers, and the like; or, where utilized, to comprise a sugar containing chewing gum composition, i.e., corn syrup, sugar, flavor, fillers and the like.

Suitable chewing gum compositions are described in U.S. Patent No. 4,514,422, U.S. Patent No. 4,579,738, U.S. Patent No. 4,581,234, and U.S. Patent No. 4,587,125, the disclosures of each being incorporated herein by reference thereto.

The amount of gum base employed will vary greatly depending on various factors such as the type of base used, consistency desired and other components used to make the final product. In general, amounts of about 5% to about 45% by weight of the final chewing gum composition are acceptable for use in chewing gum compositions, with preferred amounts ranging from about 15% to about 25% by weight. The gum base used in this invention may be any water-soluble gum base well known in the art. Illustrative examples of suitable polymers in gum bases include both natural and synthetic elastomers and rubbers. For example, those polymers which are suitable in gum bases include, without limitation, substances of vegetable origin such as chicle, jelutong, gutta percha, and crown gum. Synthetic elastomers such as butadiene-styrene copolymers, isobutylene-isoprene copolymers, polyethylene, polyisobutylene, polyvinyl acetate, and mixtures thereof, are particularly useful.

The gum base composition may contain elastomer solvents to aid in softening the rubber component. Such elastomer solvents may comprise methyl, glycerol or pentaerythritol esters of rosins or modified rosins, such as hydrogenated, dimerized or polymerized rosins or mixtures thereof. Examples of elastomer solvents suitable for use herein include pentaerythritol ester of partially hydrogenated wood rosin, pentaerythritol ester of wood rosin, glycerol ester of partially dimerized rosin, glycerol ester of polymerized rosin, glycerol ester of tall oil rosin, glycerol ester of wood rosin, partially hydrogenated wood rosin, partially hydrogenated methyl ester of rosin, and mixtures thereof. The elastomer solvent may be employed in an amount ranging from about 10% to about 75% and preferably about 45% to about 70% by weight of the gum base.

A variety of traditional ingredients used as plasticizers or softeners such as lanolin, stearic acid, sodium stearate, potassium stearate, glyceryl triacetate, glycerin, lecithin, glyceryl monostearate and the like, may also be incorporated into the gum base to obtain a variety of desirable textures and consistency properties. These additional materials are generally employed in amounts of up to about 30% by weight and preferably in amounts from about 3% to about 5% by weight of the final gum base composition.

The chewing gum compositions employing the instant gum bases generally contain sweetening agents. The sweetening agent may be selected from a wide range of materials including water-soluble agents, water-soluble artificial sweeteners, dipeptide based sweeteners, chlorosucrose derivatives including mixtures thereof.

Without being limited to particular sweeteners, representative illustrations encompass:

- A. Water-soluble sweetening agents such as monosaccharides, disaccharides, and polysaccharides such as xylose, ribose, glucose, mannose, galactose, fructose, dextrose, sucrose, sugar, maltose, partially hydrolyzed starch or corn syrup solids and sugar alcohols such as sorbitol, xylitol, mannitol, hydrogenated starch hydrolysate and mixtures thereof;
- B. Water-soluble artificial sweeteners such as the soluble saccharin salts, i.e., sodium or calcium saccharin salts, cyclamate salts, acesulfam-K, alitame, dihydrochalcones, maltitol, talin and the like, and the free acid form of saccharin; and
- C. Dipeptide based sweeteners such as L-aspartyl-L-phenylalanine methyl ester and materials described in U.S. Patent No. 3,492,131 and the like.
- D. Chlorosucrose derivatives such as sucralose.

In general, the amount of sweetener will vary with the desired amount of sweetness selected for a particular chewing gum composition. This amount will normally be 0.01% to about 90% by weight when using an easily extractable sweetener. The water-soluble sweeteners described in category A above, are preferably used in amounts of about 25% to about 75% to about 65% by weight of the final chewing gum composition. In contrast, the artificial sweeteners described in categories B and C are used in amounts of about 0.005% to about 5.0% and most preferably about 0.05% to about 2.5% by weight of the final chewing gum composition. These amounts are ordinarily necessary to achieve a desired level of sweetness independent from the flavor level achieved from flavor oils.

The chewing gum composition of this invention may additionally include the conventional additives of coloring agents such as titanium dioxide; emulsifiers such as lecithin and glyceryl monostearate; and fillers such as aluminum hydroxide, alumina, aluminum silicates, talc, dicalcium phosphate, calcium carbonate, and combinations thereof. Preferably the amount of filler used is about up to 25% by weight of the gum base.

Natural and synthetic flavoring agents well known to the chewing gum compositions of the instant invention. These flavoring agents may be chosen from synthetic flavor oils and flavoring aromatics, and/or oils, oleo resins and extracts derived from plants, leaves, flowers, fruits and so forth, and combinations thereof. Representative flavor oils include: spearmint oil, cinnamon oil, oil of wintergreen (methylsalicylate), peppermint oils, clove oil, bay oil, anise oil, eucalyptus oil, thyme oil, cedar leaf oil, oil of nutmeg, oil of sage, oil of bitter almonds, and cassia oil. Also useful are artificial, natural or synthetic fruit flavors, such as vanilla, and citrus oil, including lemon, orange, grape, lime and grapefruit and fruit essences including apple, pear, peach, strawberry, raspberry, cherry, plum, pineapple, apricot and so forth.

The amount of flavoring agent employed in the chewing gum shell is normally a matter of preference subject to such factors as flavor type, gum base type and strength desired. In general, amounts of about 0.5% to about 3.0% by weight of the final chewing gum composition are useable with amounts of about 0.3% to about 1.5% being preferred and about 0.7% to about 1.2% being most preferred.

It is preferred not to use titanium dioxide as a pigment due to the aforementioned problems. However, other pigments and colorants may be incorporated in amounts of up to 1% or higher by weight. Also, the colorants may include other dyes suitable for food, drug, and cosmetic applications, and known as FD&C dyes and lakes, which were described above.

The following examples are illustrative only and should not be construed as limiting the invention in any way. Those skilled in the art will appreciate that variations are possible which are within the spirit and scope of the appended claims.

In the examples that follow:

- (1) the saturated sorbitol solution (liquid) contained about 70% solid sorbitol and 30% liquid, and was obtained from Roquette Corporation under the product designation Roquette 70/02 Liquid;
- (2) the crystalline sorbitol powder was in the beta form and was obtained from Pfizer Inc.;
- (3) the methyl cellulose had a Brookfield viscosity of about 12 to about 18 cps for a 2% aqueous solution at 25.C;
- (4) the hydroxypropyl cellulose had a Brookfield viscosity of not less than 145 cps for a 10% aqueous solution at 25.c; and
- (5) the hydroxypropyl methyl cellulose had a Brookfield viscosity of about 12 to about 18 cps for a 2% aqueous solution at 25.C.

Also, in the examples that follow, the chewing gum composition used as the cores, had a moisture

content of about 1.5 wt % based on the weight of the chewing gum composition.

Additionally, in the examples that follow, unless indicated otherwise, a coating layer applied is dried before a subsequent layer is applied.

All percentages recited throughout the specification are based on the weight of solution used unless indicated otherwise.

Unless indicated otherwise, in the Examples that follow the procedures and formulations used were as in Example I.

EXAMPLE I

In this Example, representative of the invention, the sorbitol coated chewing gum cores of Table 3 were prepared in a CHICLETS® (Trademark of Warner-Lambert Company) type format.

Solutions A&B, used in making the coated cores are set forth in Tables 1 and 2 respectively. The solutions were prepared using a Colloidal Mill Gifford-Wood Co. homo-mixer.

In the preparation of the solutions, the order of mixing the ingredients is critical. However, as those skilled in the art can appreciate, the celluloses which are solids are difficult to disperse. Therefore, solutions containing them are conveniently made by first dispersing the cellulose and the ingredient having the most amount of water. The celluloses are dispersed using high shear (vigorous mixing) generally before any other solid is dissolved in the solution. This dispersion is then milled using the colloid mill, until a smooth, creamy solution is achieved. Milling of the cellulose/water mixture is critical to achieving a homogenous solution. After the colloidal milling, the particle size (mean) of the cellulose particles was about 10 microns with a range of 0.7-15.0 microns.

The coatings obtained were smooth and uniform in color. When chewed, the coatings were hard and crunchy.

Solution A, Table 1, as prepared in two steps. In step 1, an aqueous solution is heated and maintained at 55° C to 60° C and ingredients No. 2 and 4 are added with agitation until they are well dispersed. This dispersion is then milled using a colloid mill set at gap setting 15. To this is added ingredient Nos. 1, 2, 5 & 6 in consecutive order, while mixing between each addition.

TABLE 1

SOLUTION A		
NO.	INGREDIENTS	PERCENT (W/W)
1	Saturated Sorbitol Liquid	76.50
2	Crystalline Sorbitol Powder	16.22
3	Methyl Cellulose USP 15	0.86
4	Hydroxypropyl Cellulose	0.35
5	Calcium Carbonated Precipitated USP	4.62
6	Gum Arabic Powder	1.45
		100.00

TABLE 2

SOLUTION B		
NO.	INGREDIENTS	PERCENTAGE (W/W)
1	Saturated Sorbitol Liquid	81.14
2	Crystalline Sorbitol Powder	13.61
3	Calcium Carbonate Precipitated USP	4.04
4	Gum Arabic Powder	1.21
		100.00

TABLE 3

SORBITOL COATED CHEWING GUM		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Chewing Gum Cores	63.000
2	Solution A	30.373
3	Solution B	6.450
4	Peppermint Flavor Oil	0.135
5	FD&C Green No. 1	0.017
6	Wax	0.025
		100.00

Solution B, Table 2 was prepared by adding ingredient No. 4 to about 10% of ingredient No. 1 at room temperature and mixing for about 10 minutes. The dispersion is then heated to about 60° C, milled and added to the remaining amount of ingredient No. 1. Ingredients Nos. 2 and 3 are then mixed in and the solution is allowed to cool to about 25° C to about 35° C for using in processing and coating. The specific gravity at 30° C is 1.25, the viscosity at 30° C is 120 cps \pm 20cps, measured with a Brookfield Viscometer, model LVT, spindle at 3 at 30 RPM for one minute.

The sorbitol coated chewing gum of Table 2 was prepared by placing the chewing gum cores in the copper pan of the coating unit. The pan was rotated until all of the sheets were broken into individual cores, i.e., all the cores were separated.

Solution A (Table 1), was then applied to the cores in small portions with intermittent drying at about 50° C - 58° C until the coated cores had about a 28% total shell coating, based on the weight of the total coated comestible. At between about a 13% to 27% total shell coating, 1.5g of peppermint oil were applied respectively. At between about a 18% to about 31% total shell coating, 2.0 g of FD&C Green No. 1 dye was applied.

Solution B (Table 2), was applied next at room temperature in small portions again with intermittent drying until the total shell coating on the core was about 37%. At a total shell coating of about 32%, 1.5g of peppermint flavor oil was applied.

When the coated cores were dry they were placed in a polishing pan and wax coated. The polishing time was about 25 to about 30 minutes.

EXAMPLE II

In this example, representative of the invention, the sorbitol coated chewing gum cores of Table 8 were prepared. Solutions C and D used in making the coated core are set forth in Tables 4 and 5, respectively. When coated the coating produced on the chewing gum was smooth with an even color distribution. When

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product was evaluated it was found that the coating provided a hard and crunchy chew similar to sugared Chiclets®.

TABLE 4

SOLUTION C		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Saturated Sorbitol Liquid USP FCC	80.00
2	Crystalline Sorbitol Powder S692	11.00
3	Calcium Carbonate Precipitated USP	4.50
4	Hydroxypropyl Cellulose	0.40
5	Methyl Cellulose USP 15	0.90
6	Gum Arabic Powder	1.00
7	Water Deionized	2.20
		100.00

TABLE 5

SOLUTION D		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Saturated Sorbitol Liquid USP FCC	86.00
2	Crystalline Sorbitol Powder S692	10.00
3	Calcium Carbonate Precipitated USP	3.00
4	Gum Arabic Powder	1.00
		100.00

TABLE 6

COLOR GREEN SHADE SOLUTION		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Green Shade Color (96% purity)	4.00
2	Water, Deionized	96.00
		100.00

TABLE 7

SEALANT AND POLISHING AGENTS		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Wax Candelilla Powdered	100.00

TABLE 8

SORBITOL COATED CHEWING GUM		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Chewing Gum Cores	60.00
2	Solution A	30.00
3	Solution B	9.00
4	Peppermint Flavor Oil	0.25
5	FD&C Green NO. 1	0.25
6	Wax	0.05
		<u>100.00</u>

The solutions were prepared using a Colloidal Mill, Gifford-Wood Co., in a similar fashion as previously described. The coated chewing gum, Table 8, was prepared as follows:

Solution C (Table 4) was applied until the coated cores contained 32% total shell coating, based on the weight of the total coated comestible. At between about 13%, 30% and 33% coating (total shell coating) 3.0 g of peppermint oil was applied. At between about 18% to about 33% (total shell coating) 1.0 g of FD&C Green No. 1 dye was applied.

Solution D (Table 5) was applied next in small portions again with intermittent drying until the total shell coating was about 40% (total shell coating) 1.5 g of FD&C Green No. 1 dye was applied. When the coated cores were dried and conditioned, they were placed in a Canvas-lined Polishing pan. The polishing pan was started, revolving at 26-33 RPM with warm air being applied (30-35 °C) for 10 minute prior to the addition of the polishing-sealant agent, which is then applied. The total polishing time was about 25 to about 30 minutes.

EXAMPLE III

In this example, representative of the invention, the sorbitol coated chewing gum cores of Table 13 were prepared. Solutions E and F were prepared similarly as in Example I and II; however, no gum arabic was used in solution E. Solution G was prepared and used as the sealant agent.

The coatings obtained were smooth, hard, with crunchiness and even color distribution.

Solutions E and F, used in making the coated cores are set forth in Tables 9 and 10 respectively. The solutions were prepared using a Colloidal Mill and a Gifford-Woods Co. (Homogenizer).

As in the Example I the comments noted apply in the preparation of the solutions.

TABLE 9

SOLUTION E		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Saturated Sorbitol Liquid USP FCC	70.00
2	Crystalline Sorbitol Powder S692	18.00
3	Calcium Carbonate Precipitated USP	7.00
4	Hydroxypropyl Cellulose	2.00
5	Methyl Cellulose USP 15	2.00
6	Water Deionized	1.00
		<u>100.00</u>

TABLE 10

SOLUTION F		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Saturated Sorbitol Liquid USP FCC	79.00
2	Crystalline Sorbitol Powder S692	15.00
3	Calcium Carbonate Precipitated USP	4.00
4	Gum Arabic Powder	1.00
5	Water Deionized	1.00
		<u>100.00</u>

TABLE 11

SOLUTION G		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Water Deionized	75.00
2	Gum Arabic Powder	25.00
		<u>100.00</u>

TABLE 12

COLOR GREEN SHADE SOLUTION		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Green Shade Color (96% purity)	4.00
2	Water, Deionized	96.00
		<u>100.00</u>

TABLE 13

5	SORBITOL COATED CHEWING GUM		
	NO.	INGREDIENTS	PERCENTAGE W/W
	1	Chewing Gum Cores	70.00
	2	Solution E	20.00
10	3	Solution F	7.21
	4	Solution G	2.00
	5	Peppermint Flavor Oil	0.19
	6	FD&C Green No. 1	0.20
	7	Wax	0.40
15			100.00

Solution E (Table 9) was prepared in two steps as in Example 1. Ingredient No. 6 was heated and maintained at about 55° C to about 60° C for approximately 5 minutes, at which time ingredient Nos. 4 and 5 were admixed into it. The mixture was milled with a colloid mill with a gap setting of 15. The mixture was cooled to 35 to 45° C to obtain a Brookfield viscosity at 40° C of about 350 to 400 cps, spindle #30 at 30 RPM for one minute. The second step is to add to this dispersion ingredient No. 1, while mixing at room temperature until a homogenous mixture is obtained. This mixture is then heated to about 55° C \pm 3° C, at which time ingredient Nos. 2 and 3 were added. The specific gravity at 55° C was 1.5; the Brookfield viscosity at 55° C was 100 cps using spindle #3 at 30 RPM for one minute.

Solution F (Table 10) was prepared similarly to Solution E. Ingredient No. 4 was added to 10% of the total ingredient No. 1 at room temperature and mixed for about 10 minutes. The resultant dispersion was heated to about 60° C, milled and the remainder of ingredient No. 1. was added at room temperature. The solution was then heated again to about 50° to about 58° C and ingredients Nos. 2 and 3 were added and mixed in to obtain a solution having a specific gravity at 30° C of 1.23 and a Brookfield viscosity at 30° C of 110 \pm 20 cps using spindle #3 at 30 RPM for one minute.

Solution G (Table III) was prepared by mixing cooled ingredient No. 1 (20-25° C) with ingredient No. 2 to form a dispersion. The dispersion is then milled as in previous Examples. The solution was then heated for about 5 to 10 minutes at about 80° C to about 90° C before use.

The sorbitol coated chewing gum of Table 12 was prepared by placing the chewing gum cores in the copper pan of the coating unit. The pan was rotated until all of the sheets were broken into individual cores, i.e., all the cores were separated.

Solution E (Table 9), was then applied to the cores in small portions with intermittent drying at about 50° C to about 58° C, until the coated cores had 23% total shell coating, based on the weight of the total coated comestible. At between about 10% and 20% total shell coating 1.0 gm of peppermint oil was applied respectively. At between about 15% to about 23% total shell coating 1.5 gm of FD&C Green No. 1 dye was applied.

Solution F (Table 10), was applied next at room temperature in small portions again with intermittent drying until the total shell coating on the core was about 30%. At a total shell coating of about 25%, 1.0 gm of peppermint oil was applied.

At between about a 23% to about 30% total shell coating 1.5 gm of the FD&C Green No. 1 dye was applied.

Solution G was applied next in small portions with intermittent drying until the total shell coating of the core was about 30.5% total shell coating based on the weight of the total coated comestible. At between about 30% to about 30.5% total shell coating 0.3 to 0.5 gm of the FD&C Green No. 1 dye was applied.

EXAMPLE IV

In this example, representative of the invention, the sorbitol coated chewing gum cores of Table 18 were prepared. Solutions A, B and G were prepared similarly as in Example I and II. However, no gum arabic was used in Solution A. Solution G was prepared and used as the sealant agent. Solutions were used

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in making the coated chewing gum cores as set forth in Tables 14 and 16 respectively. Solution G was prepared as in Example III.

TABLE 14

SOLUTION A		
NO.	INGREDIENTS	PERCENTAGE (W/W)
1	Saturated Sorbitol Liquid USP FCC	75.00
2	Crystalline Sorbitol Powder S692	15.00
3	Calcium Carbonate Precipitated USP	3.00
4	Polyethylene Glycol	3.00
5	Methyl Cellulose USP 15	1.50
6	Hydroxypropyl Methyl Cellulose	1.50
7	Water Deionized	1.00
		<u>100.00</u>

TABLE 15

SOLUTION B		
NO.	INGREDIENTS	PERCENTAGE (W/W)
1	Saturated Sorbitol Liquid USP FCC	80.00
2	Crystalline Sorbitol Powder S692	12.00
3	Calcium Carbonate Precipitated USP	5.00
4	Propylene Glycol USP	2.00
5	Gum Arabic Powder	1.00
		<u>100.00</u>

TABLE 16

SOLUTION G		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Water Deionized	75.00
2	Gum Arabic Powder	25.00
		<u>100.00</u>

TABLE 17

COLOR ORANGE SOLUTION		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Water Deionized	90.00
2	FD&C Yellow	10.00
		100.00

TABLE 18

NO.	INGREDIENTS	PERCENTAGE W/W
1	Chewing Gum Cores	63.00
2	Solution A	26.49
3	Solution B	7.27
4	Solution G	2.75
5	Natural Orange Flavor	0.16
6	Orange Color, FD&C Yellow No. 6 Dye	0.20
7	Wax	0.03
		100.00

Solution A (Table 14), was prepared in the same manner as in Example I. When the solution was milled and completely homogenous it was removed from the homogenizer and heated and maintained at about 50 to about 55° C with agitation during use. Solution A was applied at about 50 to about 55° C; preferably about 51 to about 53° C.

Solution B (Table 15), was prepared similarly to Example III, whereby ingredients Nos. 4 and 5 were added to 10% of ingredient No. 1 and milled. Ingredients Nos. 2 and 3 were then added as in previous Examples.

Solution G (Table 16), the sorbitol coated chewing gum of Table 18 was prepared by placing the chewing gum cores in the coated pan of the coating unit. The pan was rotated until all the sheet were broken into individual cores, i.e., all the cores were separated.

Solution A (Table 14), was applied to the cores in small portion with intermittent drying at about 50° C to about 58C until the coated cores had about a 28 to about 30% total shell coating, based on the weight of the total coated comestible. At between about 13% to about 27% total shell coating about 2.0 gm of the Natural Orange Flavor were applied. At between about 18% to about 31% total shell coating, about 1.0 gm of FD&C Yellow No. 6 dye was applied.

Solution B (Table 15), was applied next at room temperature in small portions again with intermittent drying until the total shell coating on the core was about 37%. At a total shell coating of about 32%, about 1.0 gm of the Natural Orange Flavor was applied. At about 28% to 37% 1.0 g of FD&C Yellow No. 6 dye was applied.

Solution G (Table 16), was then applied next in small portions again with intermittent drying until the total shell coating of the core was about 37.5% to about 38.0% total shell coating, based on the weight of the total coated comestible. At about 37% to about 38% total shell coating, 0.3 to 0.5 gm of the FD&C Yellow No. 6 dye was applied.

EXAMPLE V

In this example, representative of the invention the sorbitol coated compressed tablet candy cores of Table 22 were prepared. Solutions H and J used in making the coated cores are set forth in Tables 19 and

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20. Solutions were prepared similarly to Example II. When product was coated the coating produced on the compressed tablet was smooth with an even color distribution. When product was chewed it was found that the coating was hard and provided good texture while dissolving in the mouth.

TABLE 19

SOLUTION H		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Saturated Sorbitol Liquid USP FCC	81.00
2	Crystalline Sorbitol Powder S692	12.00
3	Calcium Carbonate Precipitated USP	2.60
4	Hydroxypropyl Methyl Cellulose USP	0.43
5	Hydroxypropyl Cellulose NF Type EF	0.23
6	Gum Arabic Powder, USP	0.04
7	Water, Deionized	3.70
		<u>100.00</u>

TABLE 20

SOLUTION J		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Saturated Sorbitol Liquid USP FCC	90.00
2	Crystalline Sorbitol Powder S692	7.00
3	Hydroxypropyl Methyl Cellulose USP	2.00
4	Gum Arabic Powder, USP	1.00
		<u>100.00</u>

TABLE 21

COLOR ORANGE SOLUTION		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Water Deionized	90.00
2	FD&C Yellow No. 6	10.00
		<u>100.00</u>

TABLE 22

SORBITOL COATED COMPRESSED TABLET		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Compressed Tablet Candy Cores	60.00
2	Solution H	32.00
3	Solution J	7.80
4	Natural Orange Flavor	0.15
5	Orange Color, FD&C Yellow No. 6	0.02
6	Wax	0.03
		100.00

The solutions H and J were prepared using a Colloidal Mill, Gifford-Wood Co. (Homogenizer), using the methods described as in Example I. The sorbitol coated compressed tablet candy cores of Table 22 were prepared by placing the candy cores in the copper pan of the coating unit. The pan was rotated until all of the cores were clean and dedusted.

The compressed tablet candy cores were prepared utilizing conventional methods known to all involved in the art. As an illustration the following product formulation is described:

TABLE 23

COMPRESSED TABLET CANDY CORES FORMULATION		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Sorbitol Liquid Neosorb 20/60	50.88
2	Crystalline Sorbitol Powder	46.26
3	Magnesium Stearate, FCC, NF	1.00
4	Aspartame	0.04
5	Citric Acid USP Granular	1.00
6	Natural Orange Flavor	0.80
		100.00

Solution H (Table 19) was then applied to the cores in small portions with intermittent drying at about 122° F to about 131° F until the coated cores have 32% to about 34% total shell coating, based on the weight of the total coated comestible. At between about 8% to about 32% 2.0 gm of the Natural Orange Flavor were applied.

At between about 1% to about 34% total shell coating 1.0 gm of the FD&C Yellow No. 6 was applied.

Solution J (Table 20) was applied next in small portions again with intermittent drying until the total shell coating on the core was about 40%. At a total shell coating of about 34% to about 35% 2.0 gm of the Natural Orange Flavor were applied. At between about 34% to 40% total shell coating 1.0 gm of the FD&C Yellow No. 6 was applied.

When the coated cores were dried and conditioned, they were placed in a canvas-lined polishing pan. The polishing pan was started revolving at 26-33 RPM and warm air (30-35° C) was applied for 20 minutes prior to the addition of the polishing-sealant agent which was then applied. The total polishing time was about 25 to 30 minutes.

EXAMPLE VI

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In this example representative of the invention, the sorbitol coated compressed tablet candy cores of Table 27 were prepared. Solutions H and J were prepared similarly a in Example V. When product was coated it was found that the coating products on the compressed tablet was smooth with an even color distribution. When product was chewed it was found that the coating was hard and provided good texture while dissolving in the mouth.

TABLE 24

SOLUTION H		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Saturated Sorbitol Liquid USP FCC	81.00
2	Crystalline Sorbitol Powder S692	12.00
3	Calcium Carbonate Precipitated USP	2.60
4	Methyl Cellulose USP 15	0.43
5	Hydroxypropyl Cellulose NF Type EF	0.23
6	Gum Arabic Powder, USP	0.04
7	Water, Deionized	3.70
		<u>100.00</u>

TABLE 25

SOLUTION J		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Saturated Sorbitol Liquid USP FCC	90.00
2	Crystalline Sorbitol Powder S692	7.00
3	Methyl Cellulose NF Type ER	2.00
4	Gum Arabic Powder, USP	1.00
		<u>100.00</u>

TABLE 26

RED COLOR SOLUTION		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Water Deionized	97.00
2	FD&C Red No. 40	2.99
3	FD&C Blue No. 1	0.01
		<u>100.00</u>

TABLE 27

SORBITOL COATED COMPRESSED TABLET		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Compressed Tablet Candy Core	60.00
2	Solution H	32.00
3	Solution J	7.80
4	Cherry Flavor Imitation	0.15
5	Red Color Blend	0.02
6	Wax	0.03
		100.00

The solutions H and J were prepared using a Colloidal Mill, Gifford-Wood Co. (Homogenizer) using the methods described as in Examples I and V.

The sorbitol compressed tablet candy cores were prepared utilizing conventional methods known to all involved in the art. As an illustration the following product formulation is described:

TABLE 28

COMPRESSED TABLET CANDY CORES FORMULATION		
NO.	INGREDIENTS	PERCENTAGE W/W
1	Sorbitol Liquid Neosorb 20/60	51.00
2	Crystalline Sorbitol Powder	46.66
3	Magnesium Stearate, FCC, NF	1.00
4	Artificial Sweetener	0.04
5	Citric Acid USP Granular	1.00
6	Cherry Flavor Imitation	0.30
		100.00

Solution H was then applied to the cores in small portions with intermittent drying at about 122° F to about 131° F until the coated cores have about 32% to about 34% total shell coating, based on the weight of the total coated comestible. At between about 8% to about 32% 2.0 gm of the cherry flavor imitation were applied. At between about 1% to about 34% total shell coating 1.5 gm of the red color blend were applied.

Solution J was applied next in small portions again with intermittent drying until the total shell coating on the core was about 40%. At a total shell coating of about 34% to about 35% 2.0 gm of the cherry flavor imitation was applied. At between about 34% to 40% total shell coating 1.5 gm of the red color blend were applied.

When the coated cores were dried and conditioned, they were placed in a canvas-lined polishing pan. The polishing pan was started revolving at 26-33 RPM and warm air (30-35° C) was applied for 10 minutes prior to the addition of the polishing-sealant agent which was then applied. The total polishing time was about 25 to 30 minutes.

CHEW PANEL TEST RESULTS

The Hedonic Chew Panel evaluation was conducted utilizing a Hedonic Acceptability test with experienced in-house panelists and with outside consumers. The Hedonic attributes evaluated were as follows:

crunch, flavor liking, texture liking, sweetness liking, color-appearance liking and overall liking, and evaluated at 15 seconds for crunch, 2 minutes and 10 minutes chew time for all other attributes.

The results obtained are shown in Table 29. The Chew Panel tests conducted for evaluation of the products are well known to those skilled in the art.

5 These results are applicable to Examples 1 through IV.

TABLE 29

Attributes	HEDONIC RATING	
	Control-1*	Test Examples I to IV
Crunch ¹ (15 sec)	3.6	5.0 ²
Overall Liking (2 min)	4.1	6.0 ²
Overall Liking (10 min)	4.6	5.8 ²
Flavor Liking (2 min)	4.4	6.2 ²
Flavor Liking (10 min)	4.7	6.2 ²
Sweetness Liking (2 min)	4.3	5.2 ²
Sweetness Liking (10 min)	4.4	5.5 ²
Texture Liking (2 min)	3.9	5.9 ²
Texture Liking (10 min)	4.0	5.8 ²
Color-Appearance Liking	4.0	6.5 ²

The Hedonic attributes were rated on a 9-point scale in which:

1 = Dislike Very Much

5 = Neither Like Nor Dislike

30 9 = Like Very Much

Control-1* Represents a competitive sugarless coated product with about 15% to about 20% total shell coating and with about equivalent and similar flavor.

Crunch¹ was the only attribute evaluated at 15 seconds chew to evaluate hardness, crispiness and texture.

35 When the results were statistically evaluated they showed the above significant differences where:

²Significant difference from Control-1*

Hedonic Chew Panel Test evaluations for Examples V and VI were also conducted via Monadic acceptability test with experienced in-house panelists. The Hedonic attributes were as follows: Flavor Liking, Sweetness Liking, Texture Liking, and Overall Appearance. Attributes evaluation took place within about the first two minutes chew and/or swallowing.

The results obtained are shown in Table 30. The chew panel tests conducted for evaluation of the products are well known to those skilled in the art. These results are applicable to Examples V and VI.

TABLE 30

Attributes	HEDONIC RATING	
	Control*	Example V
Flavor Liking	5.5	6.3
Sweetness Liking	6.7	7.0
Texture Liking	4.8	6.0
Color-Appearance Liking	6.0	7.1

The Hedonic attributes were rated on a 9-point scale in which:

1 = Dislike Very Much

5 = Neither Like Nor Dislike

9 = Like Very Much

Control* Represents a competitive product with about the same total shell coating and with about equivalent and similar flavor.

With the results were statistically evaluated all of Example V results were shown significantly different
5 from the control.

STABILITY RESULTS

10

Samples of the Examples representative of the invention were packaged in intended commercialized packages and evaluated for up to twelve months at about 25 ° C and weekly for up to six weeks at about 30 ° C to about 37 ° C. Samples were tested visually and by chew panel evaluation at every time interval for color-appearance, flavor, sweetness, crunch, and chew texture. The samples were judged satisfactory.
15 Results obtained are shown on Tables 31 and 32. Light stability assessment showed comparability to controls (sugar and sugarless coated products) after 24 hours of continuous exposure to a UV light source. Results obtained are shown on Table 33. Friability testing demonstrates that sugarless coated Examples I to IV for gum products and Examples V and VI for compressed tablets candy cores to "chip" (weight loss)
less than the control. The results are shown in Table 34.

20

TABLE 31

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<u>ORGANOLEPTIC CHEW PANEL EVALUATION RESULTS</u>							
Storage Conditions About 20 ° C to About 25 ° C							
Product	1Mth	2Mth	4Mth	6Mth	8Mth	10Mth	12Mth
Examples I to IV	3	3	3	3	3	3	3
Examples V to VI	3	3	3	3	3	3	3
Control I to IV	3	3	3	3	3	3	3
Control V to VI	3	3	3	3	3	3	3

30

35

TABLE 32

40

<u>ORGANOLEPTIC CHEW PANEL EVALUATION RESULTS</u>						
Storage Conditions About 30 ° C to About 35 ° C						
Product	1WK	2WK	3WK	4WK	5WK	6WK
Examples I to IV	3	3	3	3	3	3
Examples V to VI	3	3	3	3	3	3
Control I to IV	3	3	3	3	3	3
Control V to VI	3	3	3	3	3	3

45

The Hedonic attributes were rated on a 3 point scale in which:

- 50 0 = Unacceptable
1 = Poor
2 = Fair
3 = Good

55

TABLE 33

		Color Stability/UV Light Test Results							
5	Product	3Hrs	6Hrs	9Hrs	12Hrs	15Hrs	18Hrs	21Hrs	24Hrs
	Examples I to IV	3	3	3	3	3	2	2	2
	Examples V to VI	3	3	3	3	3	2	2	2
	Control I to IV	3	3	3	3	2	2	2	2
10	Control V to VI	3	3	3	3	2	2	2	2

The UV light test was conducted in a Sunlighter Model 100 Light Cabinet, Test Lab. Apparatus Inc. Meford NH with two RS4/G 100 Watts bulbs. The method used for evaluation is well known to those skilled in the art.

Color stability was rated on a 3 point scale in which:

0 = Total Fading

1 = Some Fading

2 = Minimal Fading

20 3 = No Fading

TABLE 34

25	FRIABILITY TEST RESULTS	
	Product	Percent of Weight Loss (%)
	Examples I to IV	0.068
	Examples V to VI	0.001
30	Control I to IV	0.100
	Control V to VI	0.050

35 Friability testing was conducted in a Van Der Kamp Friabilator at about 25 RPM. The method used is well known to those skilled in the art.

The invention being thus described, it would be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention and all such modifications are intended to be included within the scope of the claims.

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Claims

1. A process for producing a sorbitol coated comestible, comprising applying to a substantially anhydrous edible core first and second coating solutions to coat the edible core;

wherein the first coating solution comprises:

(a) from 50 to 85 wt % of sorbitol solution comprising from 65 to 75 wt % of sorbitol;

(b) from 3 to 20 wt % of crystalline sorbitol powder;

(c) from 0.10 to 10 wt % of at least one film forming agent;

50 (d) from 0.10 to 15 wt % of at least one crystallization retardant including powdered gum arabic; and (e) water; and

wherein said second coating solution comprises:

(a) from 50 to 90 wt % of sorbitol solution comprising from 65 to 75 wt % crystalline sorbitol powder;

(b) from 5 to 20 wt % of crystalline sorbitol powder;

55 (c) from 0.5 to 10 wt % of at least one crystallization retardant including powdered gum arabic; and (d) water; and

after application of each coating solution, drying the solution to prepare a final comestible.

2. A process according to claim 1, which also includes applying a sealing coating solution to the coated

comestible after the second sorbitol coating solution has been applied and dried.

3.. A process according to claim 1 or 2, in which more than one layer of first coating solution is applied, after which more than one layer of second coating solution is applied.

4. A process according to claim 1, 2 or 3, wherein the first coating is built up by application of the first
5 coating solution until it constitutes from 28 to 32%, preferably from 30 to 32%, by weight of the coated comestible.

5. A process according to claim 1, 2, 3 or 4, wherein the second coating solution is applied until there is built up a shell coating constituted by the first and second coatings and equivalent to from 30 to 40%, preferably from 33 to 37%, by weight of the coated comestible.

10 6. A process according to any preceding claim, which also includes applying a solution comprising an additive selected from water soluble FD&C dyes and lakes, flavouring agents and mixtures thereof to the comestible after the first sorbitol coating solution has been applied and before the second sorbitol coating solution is applied.

7. A process according to any preceding claim, wherein the first solution also contains an ingredient
15 selected from plasticizers, moisture absorbents and mixtures thereof, and the second solution also contains an ingredient selected from plasticizers, film-forming agents, and mixtures thereof.

8. A process according to claim 7, wherein the film-forming agent of the first and second coating solutions, is independently selected from hydroxypropyl cellulose, hydroxypropyl methyl cellulose, methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, gelatin and mixtures thereof; and the crystallization retardant of the
20 first and second coating solutions is independently selected from calcium carbonate, powdered gum arabic, talc, magnesium trisilicate and mixtures thereof.

9. A process according to claim 8, wherein the film-forming agent of the first and second solutions comprises hydroxypropyl cellulose and methyl cellulose and the crystallization retardant of the first and second solutions comprises powdered gum arabic and calcium carbonate.

25 10. A process according to claim 7, 8 or 9, wherein the plasticizer of the first and second solutions is independently selected from polyethylene glycol, polyvinyl pyrrolidone, oligomers of polypropylene glycol, water soluble natural gums, and mixtures thereof; and the moisture absorbent is selected from mannitol, dicalcium phosphate, talc, magnesium stearate, calcium phosphate, calcium sulphate, silicas, and mixtures thereof.

30 11. A process according to any preceding claim, wherein the edible core comprises chewing gum, candy, or a pill or tablet for medicinal or therapeutic purposes.

12. A process according to claim 3 or to any one of claims 4 to 11 when appendant to claim 3, wherein after an 18 to 30 wt %, preferably 28 to 32%, shell coating has been built up with the first coating solution, a solution comprising a water soluble FD&C dye is applied to said comestible, the dye preferably being
35 FD&C Green No. 1.

13. A process for producing a sorbitol coated comestible, comprising applying to a substantially anhydrous edible core first and second coating solutions to coat the edible core, which process comprises:

(A) repeatedly coating the core with the first coating solution until a shell coating is built up which constitutes from 28 to 32%, preferably from 30 to 32 wt %, of the total coated comestible weight, which
40 first solution comprises

- (a) from 25 to 85 wt % sorbitol solution comprising from 65 to 75 wt % sorbitol,
- (b) from 3 to 20 wt % crystalline sorbitol powder,
- (c) from 0.10 to 10 wt % of at least one film-forming agent, selected from hydroxypropyl cellulose, hydroxypropyl methyl cellulose, methyl cellulose, ethyl cellulose, hydroxyethyl cellulose, gelatin and
45 mixtures thereof,
- (d) from 0.10 to 15 wt % of a crystallization retardant comprising powdered gum arabic and calcium carbonate, and
- (e) water;

(B) applying to the coated core from 0.01 to 0.2 wt % of a flavouring agent selected from peppermint oil, spearmint oil, oil of wintergreen, fruit flavours and mixtures thereof;

(C) applying to the coated core from 0.01 to 0.05 wt % of a water soluble FD&C dye;

(D) subsequently repeatedly coating said core with the second coating solution until a total shell coating is built up which constitutes from 30 to 40%, preferably from 33 to 37 wt % of the total coated comestible weight, which second solution comprises

- 55 (a) from 50 to 90 wt % sorbitol solution comprising from 65 to 75 wt % sorbitol,
- (b) from 5 to 20 wt crystalline sorbitol powder,
- (c) from 0.5 to 10 wt % of a crystallization retardant comprising powdered gum arabic and calcium carbonate, and

(d) water; and

(E) after application of each coating solution, drying of the comestible to prepare a final comestible.

14. A process according to claim 13, further including applying a sealing coating to the coated comestible after the second coating solution has been applied.

5 15. A process according to claim 14, wherein the sealing coating comprises a sealant selected from a blend of natural and artificial food grade waxes, candelilla wax and shellac.

16. A process according to claim 13, 14 or 15, wherein the water soluble FD&C dye is FD&C Green No. 1.

17. A process according to any one of claims 13 to 16, wherein the first coating solution contains a plasticizer in an amount of from 0.1 to 1.0 wt %, the second coating solution contains a plasticizer in an
10 amount of from 0.1 to 1.0 wt %, the plasticizer for the first and second solution being selected from polyethylene glycol, polyvinyl pyrrolidone, oligomers of polypropylene glycol, water soluble natural gums and mixtures thereof.

18. A process according to any one of claim 13 to 17, wherein the film forming agent comprises a mixture of hydroxypropyl cellulose and methyl cellulose.

15 19. A process according to any one of claims 13 to 18, wherein the crystallization retardant further includes one or more ingredient selected from talc and magnesium trisilicate.

20. A process according to any one of claims 13 to 19, wherein the first coating solution contains a moisture absorbent selected from mannitol, dicalcium phosphate, talc, magnesium stearate, calcium phosphate, calcium sulphate, silicas and mixtures thereof.

20 21. A process according to claim 20, wherein the plasticizer comprises polyethylene glycol, the film forming agent comprises a mixture of hydroxypropyl cellulose and methyl cellulose, the crystallization retardant comprises a mixture of calcium carbonate and powdered gum arabic, and the moisture absorbent is mannitol.

22. A sorbitol coated comestible product comprising:

25 an anhydrous edible core;

at least one first coating comprising

(a) from 65 to 75 wt % sorbitol,

(b) from 3 to 30 wt % crystalline sorbitol powder,

(c) from 0.10 to 10 wt % of at least one film forming agent, and

30 (d) from 0.10 to 15 wt % of at least one crystallization retardant including powdered gum arabic; and at least one second coating comprising

(a) from 65 to 75 wt % sorbitol,

(b) from 5 to 20 wt % crystalline sorbitol powder, and

(c) from 0.5 to 10 wt % of at least one crystallization retardant including powdered gum arabic.

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